# MINE ESCAPE PLANNING & EMERGENCY SHELTER WORKSHOP

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**South Africa**

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# Overview

- South African Approach
- Three main focus areas
  - Underground fresh air
  - Getting to it
  - Getting to surface
- Current Practices
- Research
- Potential Needs
- Conclusions

# South African Approach

- Mine Health and Safety Act
  - Hazard Identification and Risk Assessment based (HIRA)
- Emergency Preparedness & Response – Risk Based

# South African Approach in HIRA Practice

# Underground Fresh Air – Current Practice


- Hard Rock Mines
  - 30 minutes from work area – based on SCSR duration
  - Rescue Bay requirements
    - Compressed air
    - Water
    - Communications
    - First-aid
  - Sufficient size for deployed workforce

# Underground Fresh Air – Current Practice


- Coal mines
  - 1 400 m maximum from work area – DME guideline, based on belt worn SCSR duration
  - Fixed and Portable
  - Fixed
    - Access from surface for rescue – air from surface, communication, water, first-aid and rescue access.
    - If no surface access 24 hours life support - oxygen candles, first aid, water, communications.
  - Portable
    - 24 hours duration, oxygen candles, first aid
    - OEM design (Survive-Air, MARS, etc)
  - Focus on Collieries

# Underground Fresh Air – Research


- Most rescue bays designs and layouts in-house based on DME guidelines (fixed and portable)
- Mine Health and Safety Council (MHSC) – Public funding
  - Assessment of the design of refuge bays in coal mines – COL 115
  - Feasibility of using radio-assisted location of refuge bays (REBLE) – COL 224 (cancelled)
  - Manual of best practice for emergency response procedures – COL 605

# Underground Fresh Air –Needs


- Guidelines on maintenance of rescue bays
- Clear guidelines on location of rescue bays
- Sealing off of rescue bays
- Use of oxygen candles – fire risk, duration
- Flameproof and intrinsically safe issues – portable units
- Minimum design criteria for portable rescue bays
- Multiple entries into portable rescue bays

# Get Miners to Underground Fresh Air – Current Practice

**Get Miners to U/G Fresh Air**

**Assistance to 'section waiting' place:**

- Belt worn SCSR based
- All miners in U/G coal mines issued with belt worn SCSR
  - Each miner issued with dedicated unit
  - Provide assistance to rescue bays or long duration caches
- SCSR durability
  - Annual testing program – 1 % of all deployed SCSR tested annually (1 200/annum)
  - CSIR select and test with use of breathing simulator
    - Test criteria $O_2$, $CO_2$ and breathing resistance
  - Tripartheid Technical Committee oversee testing – state, OEMs & labor
  - Guidance on technical issues and testing specifications

# Get Miners to Underground Fresh Air – Current Practice

**Get Miners to U/G Fresh Air**

**Assistance from ‘ section waiting’ place:**

- Use of long duration units - chemical or compressed air
- Guidance systems
  - Guide rope with directional cones most common
  - Audio systems
- Rescue bays marked – audio, visual and physical
- Issue with enough air to reach 2nd rescue bay (some mines)

# Get Miners to Underground Fresh Air – Research

**Get Miners to U/G Fresh Air**

**Assistance to 'section waiting' place:**

- Mine Health and Safety Council (MHSC) – Public funding
  - Use of ULF for communication and control following an explosion – COL108
  - Procedures to overcome disorientation and visibility after explosions – GEN 101

**Assistance from 'waiting' place:**

- In-house and OEM developments

# Get Miners to Underground Fresh Air – Needs

**Get Miners to U/G Fresh Air**

**Assistance to 'section waiting' place:**

- Biggest current concern – unofficial statistics on quarterly escape training indicate that up 60 % **do not** make it
- Early warning system – Personal Safety Device (guidance and location purposes)
  - EWAC
  - Belts
  - Aromatic gasses
  - Etc.
- Non-visual guidance vs 'visual' guidance
- Preparedness training – surviving teams usually have brigades men with them
- Use of goggles with SCSR

# Get Miners to Underground Fresh Air – Needs

**Get Miners to U/G Fresh Air**

**Assistance from 'section waiting' place:**

- Effective system – engage more than one sense
- Reliability of systems after fire or explosion

# Get Miners to Surface Fresh Air – Current Practice

## Mines Rescue Service (MRS)

- Brigade system
  - Volunteer based
  - Region and country wide
- MRS independent organization
  - Rescue co-ordination centralized
  - Brigades men training done by MRS - intense
  - Annual assessment training of brigades men
- Very successful
  - Good track record

**Get Miners to Surface Fresh Air**

# Get Miners to Surface Fresh Air – Research

**Mines Rescue Service**

- Continued improvement
- Focus on human physiological response

**Get Miners to Surface Fresh Air**

# Get Miners to Surface Fresh Air – Needs (Challenges)

- Advancement rather than needs
- Physiological response – heat
- Declining numbers of brigades men

# Conclusions

- Getting the miner to the ‘section waiting’ place biggest issue
  - Guidance in high stress no-visibility situation
    - Human response
    - Technology assistance
- Guidelines on ‘Best Practice’
  - Rescue bases
  - Withdrawal practices – early warning & guidance systems
- Evaluation of ‘Best Practices’ after incidents
  - Humans
  - Technology

# THANK YOU

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